**Measuring User Performances in the Game of Kingdom Of Camelot**

**AIM**:

We want measure the performance of the User in his game play.

**ABSTRACT**:

1. User performance is multifaceted. It involves various aspects of his game. This includes amount of looted resources; number of matches won, lost or drawn; Being a Knight; Might of the army; Might of the troop lost in the battle; The boosts added by the and combat level of the enemy; strength of the wall built around the city.
2. The Best Performers tends to be the Best Attackers. They tend to avoid becoming Knights in given dataset.
3. Even though the Winning Count is high for some users are high, their overall Performance score might be low due to other factors.
4. Pseudo fights happen between the Users for the sake of gathering resources.
5. Best Knights tend to be only Knights.
6. We established the Best and Least Performing Alliances from the sum, average and standard deviation of User Performances.

**PURPOSE**:

1. It helps us understand user's performance in the game and the alliance's performance.
2. We can help the poor performers with higher boosts or recommending easier levels.
3. We can provide tougher challenging rounds for the stronger performers and medals for completing them.
4. We can establish the Leaderboard which ranks the Users/Alliances/Knights based on their performance.
5. This enriches their gaming experience.

**Procedure:**

The procedure to obtain the scores of the Users, Alliances and Knights takes into account of the following criteria:

1. The Might points: How much might a User has.
2. Looting Points: How much resources he has captured from his enemies.
3. Defense Score: A comprehensive score on user’s defense capabilities.
4. Attack Score: A comprehensive score on user’s attacking capabilities.
5. Winning Count
6. Losing Count.
7. Draw Count.

**The Might:**

Might of the army is an indication for strength towards attacking or defending the enemy. So the higher the might the better the power of attacking or defending and better the performance of the user. We have been given details of the might of the troop in from the readme file.

* For the User’s Army, we take the might of each of the troop type multiplied by the total number of troops in the army. And add all of these values to compute might of the User.
* We compute ***S0might*** and the ***S1might*** for the defending and the attacking Might power.
* We compute ***S0mightLost*** and ***S1mightLost*** based on the loss of troops on both sides sing the below formula.
* We take Log (base 10) of the Might and MightLost values in order to reduce the overflow of numbers.

**Looting points:** Looting is the act of capturing the wealth of the enemy. We give decreasing order of importance to the value of the resource captured.

|  |  |  |
| --- | --- | --- |
| No | Resource | Points |
| 1 | Gold | 10 |
| 2 | Food | 5 |
| 3 | Wood | 3 |
| 4 | Ore | 2 |
| 5 | Stone | 1 |

The Loot score is obtained by summation of amount of resources multiplied by the value of the resource. LOOT\_<RESOURCE> represents the amount of resource captured.

**DEFENSE SCORE:**

This is a comprehensive metric which measures the defending capacity of the User. It is based on the following criteria.

* The ratio of the ***Wall*** strength to the number of rounds fought (***Rounds***) is the ***Tenacity of the wall per round***. Adds to the Defense Score.
* The ***S0\_Might*** of the defending User computed earlier adds to the score.
* The ***Attack and Defense Boosts*** taken by the enemy adds to the Defense score by 10%.
* The Enemy’s Combat level adds to the Defense score by 10%.
* The ***Defence Boosts*** taken by the Defense subtracts the Defense score by 1%.
* Loots subtracts the Defense score by 15%.
* The Defense's Combat level adds to the scores.
* The ***S0\_MightLost*** by the Defense subtracts the Defense Scores by 15%.
* The ***S1\_MightLost*** of the enemy adds to the Defense Scores by 10%.
* The Defense Scores are averaged across the matches.
* We take logarithms of the value so as to tone down the numbers.

**ATTACK\_SCORE:**

This is a comprehensive metric which measures the attacking capacity of the User. It is based on the following criteria.

* The ratio of the ***Wall*** strength to the number of rounds fought (***Rounds***) is the ***Tenacity of the wall per round***. Subtracts to the Attack Score.
* The ***S1might*** of the Attack computed earlier adds to the score.
* The ***Attack and Defense Boosts*** taken by the Attackers and subtracts to the Attack score by 1%.
* The Attacker's Combat level adds to the scores.
* The ***Attack and Defense Boosts*** taken by the Defense adds to the Attack Scores by 10%.
* The Enemy’s Combat level adds the Attack score by 10%.
* Loots adds to the Attack score by 15%.
* The ***S0\_MightLost*** by the Defense adds the Attack Scores.
* The ***S1\_MightLost*** of the Attackers subtracts to the Attack Scores by 15%.
* ***Experience*** gained by the attacker adds to the scores.
* The Attack scores are added across the matches.
* We take logarithms of the value so as to tone down the numbers.

**MATCH RESULT ADDITION:**

* Match Result is 0: For a War won by the Defenders, the Attack score is reduced to its 25%.
* Match Result is 1: For a War won by the Defenders, the Attack score is reduced to its 25%.
* Match Result is 2: For a drawn War the Defense Score and the Attack score is reduced to 50%.

We sum the Defense and Attack scores of the Users across matches.

**KNIGHT SCORE**: Being a Knight in an Alliance adds to the Performance of the User.

* The ***Knight\_Defense\_Score***  is simply **log of**  **10%** of the Attack Scores which accrues the Knight User.
* The ***Knight\_Attack\_Score*** is simply **log of 10%** of the Defense scores which accrues the Knight user.
* The Knight Scores are ***doubled*** if the Knight led the army to ***win***.
* It is ***halved*** if he led the army to ***lose***.

**ALLIANCES SCORES: it is summation of Users Scores in the Alliance.**

* Alliance\_Defence\_Scores : The sum of all Defence scores in the alliance users
* Alliance\_Attack\_Scores : The sum of all Attack Scores in the alliance users.
* Alliance\_Might: The sum of all Might in the alliance users.

**HUGE NUMBERS**:

In order to avoid showing huge numbers and yet have a clear notion of the variation in values we choose to have LOG to the base 'e' of the numbers.

**USER PERFORMANCE:**

User Performance is influencing in each of the above criteria in addition to the number of Winning, losing and drawn battles(Result=2). Thus we have the following formula.

**BEST PERFORMING USERS:**

Based on our criteria the following is the result best performing users.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No | Userid | Defense Score | Attack Score | WinCount | LostCount | DrawCount | Knight  AtkScore | Knight  DefScore | **User Performance** |
| 1 | 100218 | 326.8772 | 4955.199 | 17688 | 151 | 150 | 0 | 0 | 23271.08 |
| 2 | 6344024 | 1278.306 | 12549.81 | 7518 | 75 | 155 | 0 | 0 | 21576.12 |
| 3 | 3765281 | 3674.813 | 4366.809 | 12027 | 257 | 1026 | 0 | 0 | 21351.62 |
| 4 | 73494 | 5421.98 | 10377.65 | 4776 | 726 | 57 | 0 | 0 | 21358.63 |
| 5 | 115101 | 1359.22 | 11488.51 | 6519 | 228 | 469 | 0 | 0 | 20063.73 |

Note that the even though the ***WinCount*** of the User id 3765281 is ***higher*** than User 6344024 the ***defense and the attack scores are lower*** 6344024’s defense and Attack Scores. And this differentiation is crucial as there could be a lot of easy wins and tough losses which has to be evaluated with weights. Surprisingly ***the best users are not the best Knights***. In fact they were never knights in the given dataset.

**BEST DEFENDERS: PSEUDO WARRIOR?**

We want to understand the best defender in the population.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No | Userid | Defense  Score | Attack  Score | WinCount | LostCount | DrawCount | Knight  AtkScore | Knight  DefScore | User  Performance |
| 1 | 1492912 | 15060.61 | -4192.5 | 1391 | 92 | 1896 | 0 | 0 | 14247.11 |
| 2 | 25609 | 10325.44 | 1959.227 | 1046 | 335 | 102 | 0 | 0 | 13767.67 |
| 3 | 546844 | 8843.706 | -1035.6 | 4694 | 268 | 131 | 0 | 0 | 12901.1 |
| 4 | 9114900 | 8671.873 | 0 | 0 | 0 | 4226 | 0 | 0 | 12897.87 |
| 5 | 16986 | 8541.215 | -5163.06 | 1407 | 216 | 2722 | 0 | 0 | 7723.156 |

It looks like the Best Defenders are not the Best Attackers. The WinCount is quite high except for the highlighted User ID 9114900. This User ONLY fights with others for resources. A classic example of Pseudo Warriors whose main aim is to collect as much as wealth.

**Victory Vs Drawn Matches:**

We also took a peek at the Loot of resources to check the categories of Fights. In a war, the result could be 1 for victory, 1 for lost and 2 for a drawn match. The Difference between the Victory and Draw is that the ***Loot of Gold can only take place in Victory***.

**X AXIS:** We studied the Loot Of Gold (Log Scale) (x+1) {we add 1 to the values in order to take logarithm }

**Y AXIS:** Number of Attacking Users who have looted that amount of Gold.

**DATA:**  Attacks2.txt Total Number of Attacking Users: **5955**

OBSERVATION:

Out of 5955 Users, 13.5% or around 800 of them obtained **Zero Gold** or they have had ***only drawn matches*** .

The remaining amount of gold is gathered by fewer individuals. The highest gold is collected is 117876.

**Difference between Drawn Matches and Pseudo fights:**

Interesting theory is that the amount of resources collected when there is a drawn match leads us think that the purpose of the fight is collect resources only. But as the trend of such matches keeps increasing our confidence in that theory increases as well. Again, if the User performs only such fights and only collects Non-gold resources in his entire lifetime, it is pretty certain that there is no actual war being fought. On the other extreme there are those real warriors who do not bother with the non-gold resources at the end of their drawn matches. It could also mean that they lost the fights they fought. Following graph shows that picture where the X axis is the Category of the Attacking Users (all the attacking User indexed) and Y axis is the Percentage of Gold loots in their Total Loots at the end of the matches.

**X AXIS**: The index of the 5955 Users.

**Y AXIS:** Percentage of The Resources (Gold Vs Others)

**DATA**: Attacks2.txt.

**OBSERVATION:**

The Graph shows the distribution of looted resources Gold and Non-Gold resources.

The region where the Gold Percentage is Zero shows that the warriors was never able to win the Matches but they always were able to catch the resources. We can see that this is what they have doing all their times in data set, we could term these warriors as ***Pseudo fighters*** who collect as much as resources.

The Next Section where the region is empty could indicate that they lost all of their battles or they never wanted to catch up on the Non-gold loots when there is a loot.

**BEST ATTACKERS:**

We want to find out the best Attacker in the Population.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No | Userid | Defense  Score | Attack  Score | WinCount | LostCount | DrawCount | Knight  Atk Score | Knight  Def Score | User  Performance |
| 1 | 6344024 | 1278.306 | **12549.81** | 7518 | 75 | 155 | 0 | 0 | 21576.12 |
| 2 | 3698 | 317.4253 | **11767.03** | 4288 | 129 | 80 | 0 | 0 | 16581.46 |
| 3 | 115101 | 1359.22 | **11488.51** | 6519 | 228 | 469 | 0 | 0 | 20063.73 |
| 4 | 5738101 | 630.33 | **11128.14** | 4817 | 178 | 283 | 0 | 0 | 17036.47 |
| 5 | 5785943 | 329.5453 | **10863.94** | 4660 | 409 | 258 | 0 | 0 | 16520.48 |

Some of them are the Best Performers of the Population.

**BEST WINNERS:**

We want to find out the Best Winners on the Population.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No | Userid | Defense  Score | Attack  Score | WinCount | LostCount | DrawCount | Knight  Atk Score | Knight  Def Score | User Performance |
| 1 | 100218 | 326.87 | 4955.19 | **17688** | 151 | 150 | 0 | 0 | 23271.08 |
| 2 | 3765281 | 3674.81 | 4366.80 | **12027** | 257 | 1026 | 0 | 0 | 21351.62 |
| 3 | 1888783 | 893.88 | 5292.37 | **8069** | 202 | 5617 | 0 | 0 | 20074.25 |
| 4 | 6344024 | 1278.30 | 12549.81 | **7518** | 75 | 155 | 0 | 0 | 21576.12 |
| 5 | 1199889 | 1048.57 | 6174.17 | **6606** | 343 | 1100 | 0 | 0 | 15271.75 |

The Userid 1888783 has ***high win count but not so great defense scores or attack scores***.

**BEST KNIGHT DEFENSE:**

We want to understand the top Attacking and Defending Knights.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Userid | Defence Score | Attack Score | Win count | Lost Count | Draw Count | Knight Attack Score | Knight Defense Score | User Performance |
| 540911 | 0 | 0 | 0 | 0 | 0 | 3.90523 | **2894.515** | 2898.42 |
| 498291 | 0 | 0 | 0 | 0 | 0 | 98.24608 | **1513.95** | 1612.196 |
| 541218 | 0 | 0 | 0 | 0 | 0 | 6.09769 | **1310.01** | 1316.107 |
| 23325 | 3.78139 | 0 | 0 | 1 | 2 | -0.4332 | **1080.599** | 1086.947 |
| 131338 | 0 | 0 | 0 | 0 | 0 | 6.38656 | **964.8876** | 971.2742 |

**BEST KNIGHT ATTACKS:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Userid | Defense Score | Attack Score | WinCount | LostCount | DrawCount | Knight  AtkScore | Knight  DefScore | User Performance |
| 446175 | 0 | 0 | 0 | 0 | 0 | **363.7561** | 0 | 363.7561 |
| 452692 | 0 | 0 | 0 | 0 | 0 | **315.2038** | 6.78872 | 321.9925 |
| 427915 | 0 | 0 | 0 | 0 | 0 | **284.3576** | 219.1619 | 503.5195 |
| 452695 | 7.04536 | 0 | 0 | 10 | 6 | **271.3504** | 16.57724 | 310.973 |
| 457978 | 0 | 0 | 0 | 0 | 0 | **270.9996** | 0 | 270.9996 |

Surprisingly, **the Knights play only the role of a Knight most of the times.**

**BEST ALLIANCES:**

We calculate the best alliances when they have maximum sum of User Performances, maximum average User Performance scores and minimal standard deviation between the User Performances.

**BEST PERFORMING ALLIANCES**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| AllianceID | Sum Of User score | Average User Score | Std Dev of  User Score | Performance |
| 21114|2 | 214747.2 | 958.6929 | 3430.152 | **212275.7** |
| 20118|1 | 183082.7 | 729.413 | 1837.387 | **181974.7** |
| 21309|2 | 182634.5 | 841.6336 | 3020.774 | **180455.4** |
| 6425|1 | 166708.3 | 721.6808 | 2830.714 | **164599.2** |
| 19427|2 | 163999.7 | 569.4434 | 2452.155 | **162117** |

**LEAST PERFORMING ALLAINCES**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| AllianceID | Sum Of User score | Average User Score | Std Dev of  User Score | Performance |
| 20958|21 | -17507 | -8753.49 | 0 | **-26260.5** |
| 21334|2 | -16692.5 | -8346.25 | 0 | **-25038.8** |
| 9792|2 | -15561.8 | -282.942 | 1277.655 | **-17122.4** |
| 27250|1 | -15135.9 | -488.256 | 1134.651 | **-16758.9** |
| 21023|2 | -7499.46 | -3749.73 | 3743.332 | **-14992.5** |

These results has to be posted to a new User who is looking for an Alliance to Join.

**CONCLUSION:**

1. User performance is multifaceted. It involves various aspects of his game. This includes amount of looted resources; number of matches won, lost or drawn; Being a Knight; Might of the army; Might of the troop lost in the battle; The boosts added by the and combat level of the enemy; strength of the wall built around the city.
2. The Best Performers tends to be the Best Attackers. They tend to avoid becoming Knights in given dataset.
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